

What is claimed is:

5 1. A biochip comprising a large number of spots based on samples containing captures, said spots being arranged on a base plate by supplying, onto said base plate, a plurality of types of said samples containing said captures to be used to specifically react with a specimen in order to obtain information on a structure or a function of said specimen, wherein

10 a first substance, which acts on immobilization of said captures onto said base plate, is formed at least at portions at which said spots are to be formed on said base plate.

15 2. The biochip according to claim 1, wherein said first substance, which acts on said immobilization, is a solution sample containing no capture, and said first substance is an immobilization solution for immobilizing said captures onto said base plate.

20 3. The biochip according to claim 1, wherein said first substance, which acts on said immobilization, is a solution sample containing no capture, and said first substance is an immobilization-reinforcing solution for reinforcing said immobilization of said captures onto said base plate.

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4. The biochip according to claim 1, wherein said first substance, which acts on said immobilization of said captures onto said base plate, is formed at least at said portions at which said spots are to be formed on said base plate, and a second substance, which inhibits said immobilization of at least said captures onto said base plate, is formed at parts other than said portions at which said spots are to be formed.

5. The biochip according to claim 4, wherein said second substance is a substance which inhibits said immobilization of said captures onto said base plate and which inhibits contact of said specimen with said base plate.

6. The biochip according to claim 4, wherein said first substance is formed on an entire surface of said base plate; and said second substance is formed at parts other than said portions at which said spots are to be formed on said first substance formed on said base plate.

7. A method for producing a biochip comprising a large number of spots based on samples containing captures, said spots being arranged on a base plate by supplying, onto said base plate, a plurality of types of said samples containing said captures to be used to specifically react

with a specimen in order to obtain information on a structure or a function of said specimen, said method comprising the step of:

5 supplying a solution sample containing said capture and a solution sample containing no capture separately from each other to produce said biochip.

8. The method for producing said biochip according to claim 7, wherein said solution sample containing said capture is supplied in accordance with an ink-jet system.

9. The method for producing said biochip according to claim 7, wherein said solution sample containing no capture is supplied in accordance with an ink-jet system.

10. The method for producing said biochip according to claim 7, wherein said solution sample containing no capture is supplied in accordance with a screen printing system.

20 11. The method for producing said biochip according to claim 7, wherein said solution sample containing no capture is an immobilization solution for immobilizing said captures onto said base plate, or an immobilization-reinforcing solution for reinforcing immobilization of said captures  
25 onto said base plate.

12. The method for producing said biochip according to

claim 11, wherein said immobilization solution or said  
immobilization-reinforcing solution is a solution with which  
immobilization or immobilization reinforcement is advanced  
by mixing said immobilization solution or said  
immobilization-reinforcing solution with said solution  
sample containing said capture.

13. The method for producing said biochip according to  
claim 11, wherein said solution sample containing said  
capture is supplied onto said base plate, and then said  
immobilization solution or said immobilization-reinforcing  
solution is supplied to parts to which said sample has been  
supplied.

14. The method for producing said biochip according to  
claim 11, wherein said immobilization solution or said  
immobilization-reinforcing solution is supplied onto said  
base plate, and then said solution sample containing said  
capture is supplied to parts to which said immobilization  
solution or said immobilization-reinforcing solution has  
been supplied.

15. The method for producing said biochip according to  
claim 11, wherein said immobilization solution or said  
immobilization-reinforcing solution and said solution sample  
containing said capture are supplied substantially  
simultaneously onto said base plate.

16. The method for producing said biochip according to claim 7, wherein said captures are nucleic acids.

5 17. The method for producing said biochip according to claim 16, wherein said nucleic acid is DNA and/or fragment thereof or amplified product thereof; cDNA and/or fragment thereof or amplified product thereof; RNA or antisense RNA and/or fragment thereof or amplified product thereof; chemically synthesized DNA or amplified product thereof; or chemically synthesized RNA or amplified product thereof.

18. The method for producing said biochip according to claim 7, wherein said captures are proteins.

19. The method for producing said biochip according to claim 18, wherein said protein is antigen, antibody, lectin, adhesin, receptor for physiologically active substance, or peptide.

20. The method for producing said biochip according to claim 14, wherein said immobilization solution is a solution of chemical substance having positive charge, and said capture is immobilized by means of ionic bond.

21. The method for producing said biochip according to claim 20, wherein said chemical substance is poly-L-lysine,

polyalkylamine or a silane coupling agent such as  $\gamma$ -aminopropyltriethoxysilane.

5           22. The method for producing said biochip according to claim 14, wherein said immobilization solution includes a chemical substance for chemically modifying a base plate surface, and a functional group introduced into said base plate surface and a functional group introduced by modifying said capture are subjected to a chemical reaction to immobilize said capture onto said base plate by means of covalent bond.

10           23. The method for producing said biochip according to claim 22, wherein said chemical reaction is a reaction of amino group and aldehyde group, a reaction of amino group and N-hydroxysuccinimido group, a reaction of amino group and carboxyl group, a reaction of amino group and epoxy group, or a reaction of thiol group and epoxy group.

15           24. The method for producing said biochip according to claim 14, wherein said immobilization solution includes avidin, streptavidin, protamine, or histone.

20           25. The method for producing said biochip according to claim 14, wherein said immobilization solution is a solution containing hydrophobic group such as phenyl group and alkyl group.

26. The method for producing said biochip according to claim 14, wherein said immobilization-reinforcing solution includes a water-retentive substance.

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27. The method for producing said biochip according to claim 26, wherein said water-retentive substance is colominic acid, hyaluronic acid, or mixture of colominic acid and hyaluronic acid.

28. The method for producing said biochip according to claim 14, wherein said immobilization-reinforcing solution includes a high-molecular substance.

29. The method for producing said biochip according to claim 28, wherein said high-molecular substance is acidic polymer such as CM-cellulose, nitrocellulose, polyacrylic acid, and alginic acid; basic polymer such as polyethyleneimine and polyacrylamide; neutral polymer such as methyl cellulose, polyethylene glycol, and polypropylene glycol; or protein such as BSA, egg albumin, and lysozyme.

30. The method for producing said biochip according to claim 11, further comprising preparing a jig to which a plurality of said base plates are set, wherein said solution sample containing said capture and said solution sample containing no capture are supplied in a state in which said

base plates are fixed on said jig.

31. The method for producing said biochip according to claim 11, wherein an area, in which said solution sample containing no capture is supplied onto said base plate, is substantially the same as an area to which said solution sample containing no capture is supplied, or an area which includes said area to which said solution sample containing said capture is supplied, said area having a substantially circular shape.

32. The method for producing said biochip according to claim 11, wherein an area, in which said solution sample containing no capture is supplied onto said base plate, has a size which includes two or more areas to each of which said solution sample containing no capture is supplied.

33. A method for producing a biochip comprising a large number of spots based on samples containing captures, said spots being arranged on a base plate by supplying, onto said base plate, a plurality of types of said samples containing said captures to be used to specifically react with a specimen in order to obtain information on a structure or a function of said specimen, said method comprising the steps of:

providing a first substance which acts on said immobilization of said captures onto said base plate, at



portions at which at least said spots are to be formed; and  
forming a second substance for inhibiting at least  
immobilization of said captures onto said base plate at  
parts other than portions at which said spots are to be  
5 formed on said base plate provided with said first  
substance.

34. The method for producing said biochip according to  
claim 33, further comprising the steps of:

forming said first substance at said portions at which  
at least said spots are to be formed on said base plate; and

forming said second substance at said parts other than  
said portions at which said spots are to be formed on said  
base plate.

35. The method for producing said biochip according to  
claim 34, further comprising the steps of:

forming said first substance on an entire surface of  
said base plate; and

20 forming said second substance at parts other than said  
portions at which said spots are to be formed, on said first  
substance formed on said base plate.

36. The method for producing said biochip according to  
25 claim 33, further comprising the steps of:

using, as said base plate, a base plate on which said  
first substance is previously formed at said portions at

which said spots are to be formed; and

forming said second substance at parts other than said portions at which said spots are to be formed on said base plate.

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37. The method for producing said biochip according to claim 33, wherein said second substance is a substance which inhibits said immobilization of said captures onto said base plate and which inhibits contact of said specimen with said base plate.

38. The method for producing said biochip according to claim 33, wherein said sample containing said capture is supplied in accordance with an ink-jet system.

39. The method for producing said biochip according to claim 33, wherein said second substance is supplied in accordance with an ink-jet system.

40. The method for producing said biochip according to claim 33, wherein said second substance is formed in accordance with a screen printing method.

41. The method for producing said biochip according to claim 33, wherein said second substance is formed in accordance with a dipping method.

42. The method for producing said biochip according to claim 41, wherein

a resist is formed at said portions at which said spots are to be formed, on said first substance formed on said base plate;

said second substance is formed on an entire surface including said resist in accordance with said dipping method; and

said resist is subjected to lift-off to form said second substance at parts other than said portions at which said spots are to be formed.

43. The method for producing said biochip according to claim 33, wherein

said first substance is a chemical substance having positive charge to act on said immobilization of said captures onto said base plate by means of ionic bond; and

said second substance is a chemical substance having negative charge.

44. The method for producing said biochip according to claim 43, wherein

said first substance includes at least a silane coupling agent such as  $\gamma$ -aminopropyltriethoxysilane, poly-L-lysine, polyethyleneimine, or polyalkylamine; and

said second substance includes at least organic acid such as succinic acid and gluconic acid, or high-molecular

acid such as polyacrylic acid and alginic acid.

45. The method for producing said biochip according to claim 33, wherein

5        said first substance is a chemical substance having an active group for modifying a base plate surface to act on said immobilization of said captures onto said base plate by means of covalent bond by effecting a chemical reaction of said active group introduced into said base plate surface and a functional group introduced by modifying said captures; and

      said second substance is a chemical substance having said functional group reactive with said active group.

20        46. The method for producing said biochip according to claim 45, wherein said chemical reaction to achieve said covalent bond is a reaction of amino group and aldehyde group, a reaction of amino group and N-hydroxysuccinimido group, a reaction of amino group and carboxyl group, a reaction of amino group and epoxy group, or a reaction of thiol group and epoxy group.

      47. The method for producing said biochip according to claim 45, wherein

25        said first substance includes at least a mixture of  $\gamma$ -aminopropyltriethoxysilane and glutaraldehyde, a mixture of  $\gamma$ -aminopropyltriethoxysilane, succinic anhydride, and N-

hydroxysuccinimido, a mixture of  $\gamma$ -aminopropyltriethoxysilane and succinic anhydride, epichlorohydrin, or bisoxysilane; and

5        said second substance includes at least amino acid, tris having amino group, ethanolamine, cysteine having thiol group, glutathione, or thioglycol.

48. The method for producing said biochip according to claim 33, wherein

10        said first substance is a chemical substance for modifying a base plate surface to act on said immobilization of said captures onto said base plate by means of affinity bond; and

15        said second substance is a substance which makes said affinity bond with said chemical substance.

49. The method for producing said biochip according to claim 48, wherein

20        said first substance includes at least avidin, streptavidin, protamine, histone, biotin, antigen, antibody combining protein, or antibody; and

25        said second substance includes at least avidin, streptavidin, biotin, nucleic acid, antigen, antibody combining protein, or antibody.

50. The method for producing said biochip according to claim 33, wherein

said first substance is a chemical substance including hydrophobic group such as styrene group, phenyl group, and alkyl group for modifying a base plate surface to act on said immobilization of said captures onto said base plate by means of hydrophobic bond; and

said second substance includes at least an amphiphilic substance.

51. The method for producing said biochip according to claim 50, wherein

said first substance includes at least polystyrene or alkylbenzene; and

said second substance includes at least gelatin or casein.

52. The method for producing said biochip according to claim 33, wherein said second substance is composed of a substance having water repellency.

53. The method for producing said biochip according to claim 52, wherein said second substance includes at least silicon or fluorine.

54. The method for producing said biochip according to claim 33, wherein said captures are nucleic acids.

55. The method for producing said biochip according to

claim 54, wherein said nucleic acid is DNA and/or fragment thereof or amplified product thereof; cDNA and/or fragment thereof or amplified product thereof; RNA or antisense RNA and/or fragment thereof or amplified product thereof; 5 chemically synthesized DNA or amplified product thereof; or chemically synthesized RNA or amplified product thereof.

56. The method for producing said biochip according to claim 33, wherein said captures are proteins.

57. The method for producing said biochip according to claim 56, wherein said protein is antigen, antibody, lectin, adhesin, receptor for physiologically active substance, or peptide.